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CONTENTS

POLAND

BULGARIAN-SOVIET OCEAN EXPEDITION COMPLETED

AU241215 Sofia RABOTNICHESKO DELO in Bulgarian 23 Mar 82 pp 1, 4

[RABOTNICHESKO DELO correspondent's report from Varna on successful completion of the Soviet-Bulgarian ocean expedition, and on press conference held on 22 March on board the Soviet explorer ship "Vityaz"]

[Text] Varna, 22 Mar--"Vityaz," the Soviet explorer, has once more docked at Varna. We can admire its beautiful, white hull from far away. For almost as long as 2 months Bulgarian and Soviet experts jointly accomplished difficult research tasks and expeditions, diving at great depth in the vicinity of Cyprus and in the area surrounding the "Ampere" underwater mountain in the eastern part of the Atlantic Ocean. A press conference for numerous jornalists was held on board the "Vityaz" explorer ship today, on the occasion of the successful accomplishment of the expedition.

Prof Vyacheslav Yastrebov, doctor of technical sciences, deputy chairman of the Soviet Academy of Sciences' Oceanological Institute, and head of the expedition, described the scientific results and summed up the basic conclusions drawn from the experiments made during the expedition. "We have accomplished our scientific tasks," he stated. "We are satisfied with the work of the Bulgarian experts' team, under the leadership of Eng Nikola Dukov, candidate of technical sciences from the Varna Institute of Maritime Research and Oceanology. New technical methods and equipment for underwater research work have been applied and tested," he added.

The journalists attending the press conference were shown pictures of the "Ampere" underwater mountain, situated in the eastern part of the Atlantic Ocean, made with the underwater towing apparatus called "Sound." The other participants in the expedition also spoke on their impressions about the joint research work accomplished during the expedition.

CSO: 2202/92

BRIEFS

COOPERATION WITH ELORG CITED--Soviet foreign trade enterprise Electronorg-tekhnika (ELORG) conducts trade with companies in 30 countries, reaching a yearly turnover of 1.3 billion rubles. Elorg's exports have been increasing approximately 12 percent per year. It exports and imports computer system technology, microcomputers, office organization technology, microcalculators, active and passive electronic components and other products. During the past 10 years, Elorg delivered over 700 computers to Belgium, India, Bulgaria, Czechoslovakia, the GDR, Finland and Cuba. Favorable cooperation with several companies in France, Italy, the FRG, Spain and Greece continues. In Finland, Elorg established a computer center which serves the needs of about 80 industrial producers. Elorg has very close trade relations with producers in socialist countries. Under the agreement on specialization and cooperation in computer technology production in CEMA countries, mutual deliveries of comp uters will reach more than 15 billion rubles. Czechoslovak foreign trade establishment KOVO is one of the top trade partners of Elorg, exporting to the USSR the Consul electric typewriters, photoelectric equipment for punched tape readers, punching machines, Digigraf drafting tables and other secondary equipment for comp uter and office technology. Elorg exports to Czechoslovakia at this time third-and-half generation computers ES 1035. In a few years, Elorg will be able to offer to its partners new computer systems such as a joint system of second series of computer technology and microcomputers, a computer system for automated control of large industrial plants and large computer units such as the ES 1043. The ES 1043 has a capacity to process 1.5 million operations per second and the ES 1060 1.3 million. Both of these units have been designed to process a broad spectrum of scientific, technical and economic tasks and a large number of information. They can process data for a consumer 13,500 km distant from the computer, as well as communicate with him by telephone, telegraph or radio. They also have visual memory, a broad system of self-control and a capability to locate defects. A reduced-size ES 1060 unit was exhibited at the 1981 Brno Trade Fair. It had a capacity of 1.2 million operations per second and included the external memory equipment ES 5066, analog computer AVK 31, machine for analog computing unit AVK 32, electronic key computer Iskra 2240, electronic unit OMEGA 111-ZE, as well as other equipment. [Prague JFMNA MECHNIKA A OPTIKA in Czech No 2 1982 p 36]

CSO: 2402/44

IMPROVEMENT, AMPLE USE OF MICROPROCESSOR SYSTEM DESCRIBED

Sofia OTECHESTVEN FRONT in Bulgarian 26 Mar 82 pp 1, 3

[Article by Zakhari Nikolov: "The Microprocessor Becomes Part of Our Daily Life"]

[Text] The collector rings at the door and presents you with a bill that states that you have consumed more than 200 leva worth of electric power.... You look in amazement and then begin to try and disuade her: "This is a mistake! The apartment is heated with steam, the kitchen stove is gas, it is just impossible!..." Another case. In the mail you receive a statement that you must pay a large amount for telephone calls while in recent months there had been no one in the apartment. Many persons who have involuntarily fallen into such a situation would be inclined to accuse the primitiveness of the automatic call recording equipment, the electric meters or even the collectors. There commence complaints, letters and an excessive loss of time and strain on nerves.

Certainly such mistakes do occur rarely but all the same they do happen. And they happen because all the information concerning the electric power consumed by enterprises in the capital city of a million strong is delivered "all in a heap" for processing to a large computer just several days before the start of each month. It takes just a little inattention by the operators in filling out the cards, a wrong number or a transposed comma and...when the computer's "brain" is turned on, the bills are printed so rapidly that it is difficult to see which is right and which is not....

From Silistra has come the news of the serial production of new microprocessor computer systems called the IZOT-0250 at the Office Equipment Combine. At first glance this would seem to be some information which would interest only specialists. But the purpose of these electronic machines is to process very quickly and precisely the bills for electric power, telephone calls and scores of other statements and banking reports.

The initial fears that the old mistakes would reappear have been unfounded. In just several months of operation, the IZOT-0250 microprocessor has shown that it performs the calculations accurately and dependably and it can be relied upon.

In the center of the city where their exhibition hall is located, in addition to the IZOT-0250 microprocessor system, there is also a text-processor [?word processor], an electronic system, a warehouse control computer and so forth. In terms of

appearance the IZOT-0250 is like a small desk with a built-in keyboard, an electronic unit and printer which automatically can print up to 30 letters and figures a second. The operator punches in all the data including the name, the address of the subscriber, the reading of the electric meters or telephone counter. The information is stored on a floppy magnetic disc which is reminiscent of a plastic record. Up to 150 printed pages can be stored on a memory disc and this is the equivalent of the data from 112 subscribers. The most important part of the machine is the microprocessor which is of matchbox size. This sets the instructions for the peripheral units such as the reader, printer and so forth at a speed of up to 500,000 operations a second. Thus, having first made up the operating program for the system, the operator by merely depressing the keys can extract from the memory all that is known about the subscriber, enters the last readings from the readers while the machine itself performs the calculations and very quickly prints out the complete statement. Here mistakes cannot occur because each operator immediately checks whether the amounts entered on the blank are within the normal limits or are in error. This has certainly not always been the case.

First I visited the okrug communications administration in Silistra. In one of the rooms there were three IZOT-0250 machines at work.

The operator Zhelyazka Petrova said: "Previously we had to write out in hand 1,200 slips per day. We could not move from our desks. Now all the work is done by machine. And it is also good that it was very quick and easy for us to learn how to operate it. It took us just 15 days to train for it. And it is impossible to make mistakes. Everything is right in front of your eyes...."

The three machines processed the data for close to 8,000 telephone subscribers in the city and okrug. This means 15 million calls a quarter and they, multiplied by 2 stotinks each, produce 300,000 leva. It seemed unbelievable to me that the chief bookkeeper at the administration Stoyko Ivanov could admit that productivity had risen 30-fold after the introduction of the microprocessor systems. But this is quite natural because in addition to the fact that the documents are prepared very quickly, it becomes possible for the bank each day to receive them processed and immediately calculate the income for the system. In the past these calculations took 1 or 2 months.

As was said by Damyan Dimanov, chief account at the Serdika Dairy in Silistra: "The Orgtekhnika [Office Equipment] microprocessors help us in carrying out the new economic mechanism. Every day we delivery 50,000-60,000 containers of acid milk and fresh milk to 120 stores and points in the city. This alone is enough to gain an idea of how many bills and documents would be scattered about if before each trip the drivers did not submit their waybills for machine processing. Very accurately and quickly they can run a check and know what quantity of cheese they have shipped and how much there is at the warehouse. These figures certainly were kept before, but at a price of the continuous scribbling of scores of workers...."

Like any new equipment loaded almost to the maximum, the IZOT-0250 microprocessor system initially showed certain defects. Some mechanical parts were damaged, the printer jammed, the cables became disconnected and there were even instances of the loss of the recordings on certain magnetic discs.

As was stated by Geori Dechkov, the chief of the Electronic Data Processing Section under the Sofia Electric Supply Combine: "With such problems we immediately turn to specialists at Orgtekhnika in Silistra. For us it is very important that the machines operate constantly for 16 hours because we process around 420,000 bills a month with a value of 10 million leva. For this reason we must depend on the equipment and we intend to convert completely to using the IZOT-0250. Any problem can be corrected but it seems to me that only the people in Silistra are interested in improving the machines. There are rather many other plants and enterprises that are also involved in manufacturing the microprocessor system...."

Probably the concern of these specialists is a valid one. For this reason every day they watch how the individual assemblies of the machines operate. They have already eliminated weak points in the printer and keyboard, the magnetic discs and the electronic unit. But up to now the representatives from the other enterprises involved in producing the IZOT-0250 have not been heard from. For example, it would be possible to imagine a doubling of the typing speed and this would have to be solved immediately by the designers at the Typewriter Plant in Plovdiv. The same applies to the producers of the magnetic discs, the electronic elements and so forth.

There is one other problem. Are the new machines presently installed in suitable quarters? Unfortunately the situation is the worst at the building of Power Supply in Sofia. There five or six machines have been crowded next to one another in small and inconvenient rooms.

The first months of the IZOT-0250 have been successful. Clearly the money has not been thrown to the winds. But this good beginning must not seem to some also as a good ending.

10272
CSO: 2202/9

BRIEFS

INTERCOSMOS PROGRAM PARTICIPATION NOTED--A group of experts from the Nuclear and Physical Engineering Faculty (under Eng. K. Hamal], Czech Institute of Technology in Prague, has been participating in construction and provicing equipment for an Intercosmos network of 14 laser observatories in Europe, Asia, Africa, South America and Cuba. The CSSR-made laser radar can locate satellites and measure the distance of 10,000 km within a 20-cm margin of error. Equipment for thermal mapping of Earth has been worked on at the Institute of Physics, Charles' University. The Mathematics-Physics Faculty has been successfully involved in the Intercosmos program [project Intershock] for several years. [Prague SVOBODNE SLOVO in Czech 8 Apr 82 p 4]

CSO: 2402/43

ACQUISITION, USE OF MAGNETIC DATA CARRIERS

Budapest SZAMITASTECHNIKA in Hungarian Dec 81, Jan 82

[Article by Laszlo Bagonyi and Peter Cziffra]

[Dec 81, p 6]

[Text] At the moment we are operating seven ESZR [Uniform Computer Technology System] configurations at the EGSZI [Institute of Construction Management and Organization]--as has been reported in a number of articles and in the columns of this journal. In addition to the ESZR machines we have a SIEMENS 4004 and an IBM 370 computer. In the area of data recording, we have one RC 3600 group magnetic data recorder and a number (about 70) individual magnetic tape data recording devices.

Thus in regard to units using magnetic data carriers we have the following equipment in operation:

	Magnetic tape drive units		Magnetic tape drive units	
[as published--probably, "disc drive" intended for the second double column]				
	Type	Number	Type	Number
ESZR	5012-01/03	34	5052	6
	5017	8	5061	51
SIEMENS	4453	6	4581	8
IBM	2311/3410	4	3330/3333	4
RC	3620	2	3652	2
Total		54		71

We use a respectable quantity of magnetic data carriers each year on the above units because without exception our machines are operated on three shifts. Our services are used by more than 100 economic units throughout the country, primarily with the aid of our planning, production-control and enterprise-

management models developed for construction industry and construction materials industry enterprises and planning institutes.

We would like to share our experiences, gathered over a number of years, in connection with magnetic data carriers.

Acquisition of Magnetic Data Carriers

We plan the quantity of magnetic data carriers to be acquired each year by taking into consideration the known data (number of units, number of models run, number of enterprises and operational time); ordering is done in October, up to the end of November, of the year preceding the year in question. The following table shows the quantity of magnetic data carriers acquired by our institute from 1979 to 1981. (Quantities are converted to the 2,400-foot basic type.)

Magnetic Tapes

	BASF	RACAL	SCOTCH	Total (units)
1979	--	2,600	650	3,250
1980	2,069	950	160	3,170 (sic)
1981	1,635	500	380	2,510 (sic)

Magnetic Disk Packs

	2.5 Mbyte cartridge*	7.25 Mbyte	29 Mbyte	56 Mbyte	100 Mbyte	Total (units)
	BASF	--	--	--	--	
1979	CAELUS	56	268	--	--	
	SCOTCH	--	65	--	--	
	Total	56	333	--	--	389
	BASF	--	--	25	--	
1980	CAELUS	20	50	--	--	
	SCOTCH	--	--	--	--	
	Total	20	50	25	--	110
	BASF	--	25	5	20	
1981	CAELUS	--	--	--	--	
	SCOTCH	--	74	--	--	
	Total	--	126	5	20	151

*[as published; the missing values may be calculated from the totals]

In addition to these types, we use or have used MEMOREX and ORWO magnetic tapes and MEMOREX and IZOT magnetic-disk packs. The acquisition sources for data carriers--as is well known--are the NOTO OSZV, MIGERT, VOLAN Elktronika and PIERT enterprises.

In general we order from several suppliers, to be safe if some foreign firm has delivery difficulties--as has happened several times over the years. In the case of magnetic tapes, this is why we gave up the MEMOREX products. We had quality problems with the ORWO tapes. In the case of magnetic-disk packs, we purchased the IZOT disks together with the computer configurations.

Thus, on the basis of the calculated values we buy 2,980 magnetic tapes and 217 magnetic disks per year. The quantity of magnetic tapes can be expected to stabilize at 2,500-2,600 units per year (in the event of an unchanged machine park and task structure). In the case of magnetic-disk packs, the 7.25 Mbyte disks will "run out" after replacement of our ESZ 1020 machines. The number of units of 20 Mbyte disk packs will be about 50-80 per year. Use of the 56 and 100 Mbyte disk packs will not significantly exceed 15 units each per year.

In regard to packaging magnetic tapes, we are emphasizing a closeing-ring solution which makes for better use of storage space. We use boxes only for transportation, because of better mechanical protection properties. In the case of magnetic-disk packs, it was necessary to make claims during the quarantee period. The claims in connection with IZOT and MEMOREX disks were accepted. The number of units was not significant.

To sum up concerning acquisition problems, thus far acquisition or variety difficulties have not interfered with the execution of our tasks; the supply of magnetic data carriers has been reassuring.

Magnetic Tapes, Magnetic Tape Units

As can be seen from the table the great majority of the magnetic tape equipment to be found at our institute is the ESZ 5012/01 type of Bulgarian manufacture. The units must be compatible with each other and with the magnetic tape background storage of the other configurations. We are not thinking primarily of the compatibility of the factory parameters of the equipment but rather of the compatibility necessary for the undisturbed conduct of processing; coordinated work requires that output tapes can be read without difficulty on any of the magnetic tape units. We ensure this by having the technical experts calibrate the equipment to the same starting tape--an IBM master skew tape of 800 pbi. At least twice each year we check compatibility among computer centers and the compatibility of units within one computer center is checked monthly. We use the results of these full-circle compatibility tests in the area of magnetic data carrier acquisition, among others. We would like to share a few practical experiences discovered in the course of operation:

--In the course of acquiring magnetic data carriers we try to see that each computer center uses magnetic tape from the same manufacturer.

--It is a general experience that any of the magnetic tape products mentioned--with the exception of a few special cases--can be used equally well on the equipment used by the EGSZI.

--Special cases:

In the case of MEMOREX products, we experienced frequent slipping on the ESZ 5012/01 equipment. The cause of the phenomenon is a tape surface polished excessively fine, which spares the read/write heads but does not provide sufficient adhesion at the surface of the advancing wheel.

Writing with RACAL magnetic tapes is not sufficiently reliable on ESZ 5017 equipment. The units read even their own writing with a high error percent and they frequently proved unreadable on other types of equipment, although the magnetizability and information-preservation parameters of the RACAL tapes do not deviate from those of other products. We should note that we did our tests with a newer series tape too, lest we draw general conclusions from experiences with a faulty series.

We ordered ORWO tapes one time in 1978. Our experiences were not favorable. After brief use, the magnetic layer was worn off the carrier and the mechanical properties of the tape were not satisfactory.

Equipment with automatic tape feed cannot be loaded with WABASH tape; the carrier is too stiff and does not bend adequately.

The large-volume magnetic tape use makes it impossible to test magnetic tapes individually prior to use. In the case of known products, we accept the testing done by the manufacturer, because most manufacturers test their tapes before releasing them for sale. In the case of new products, however, we do magnetizability and life-expectancy tests on a sample and inform the shipper of our experiences.

[Jan 82 p 7] Magnetic Disks, Magnetic Disk Units

[Text] The great majority of the magnetic disk storage in our computer centers consists of 29 Mbyte units of Bulgarian manufacture. These units are subsystems of the ESZ 1022 and ESZ 1040 configurations. Many of the magnetic disk data carriers used are disk packs from various manufacturers corresponding to the IBM 2314 type.

The priority requirement for magnetic disks is compatibility within the center between disk-drive units. A less essential requirement is compatibility between centers because in general information exchange between computer centers does not take place on magnetic disk and also because the ESZ 1020, the SIEMENS and the IBM center are not compatible at the drive-unit level in regard to the computer centers with the ESZ 1022 configuration.

Technical experts assure compatibility within the center by calibrating the equipment to information on a master disk. In every case, the master disk is a type offered by the firm manufacturing the equipment. On the basis of

operational experience, there is no substantial deviation between the useability of the magnetic disks of BASF, SCOTCH, CAELUS and IZOT manufacture used by the EGSZI.

In the case of magnetic disks, we begin testing with a mechanical check of the disks being put in use; in the course of unprofessional shipping the disk surfaces may be deformed. If a deformed disk pack is placed on the drive unit an immediate breakdown occurs. The air filter must also be checked; it must be precisely in place, otherwise dust from the unfiltered air will significantly reduce the life expectancy of the disk pack. After this the procedure continues and ends with initialization.

Storage and Handling

It is best to store magnetic tapes in an air-conditioned, dust-free, isolated storage area. If air-conditioning is not possible then the tapes must be brought to the machine room at least 2 hours before they are to be used so they can take on the temperature and humidity of the machine room. In the computer center of the EGSZI, the tapes are separated according to their function and are placed in the machine room or data-storage area.

Handling Magnetic Tapes Used in the System

The tapes are regularly cleaned twice yearly and the number of their superscripts registered. Cleaning can be done quickly with mechanical tape-cleaning equipment.

The institute has tape-cleaning equipment manufactured by Control Data and KYBE and this regularly "travels" between computer centers. The maximum number of rewritings is 200, after which the tape must be scrapped as its remagnetizability deteriorates due to residual magnetism. Tapes not regularly used must be rewound at least twice a year. It is best to do this at the same time as cleaning.

Requirements for storing magnetic disks correspond to the requirements for storing magnetic tapes. The difference is that disk packs must be brought to the machine room at least 3 hours before being used. Handling disk packs is much more demanding work, partly because of their great value and partly because of their weight. One regular task is to check the air filters on the bottom of the disk packs, and exchange them if necessary. The frequency of the checks is always a function of the cleanliness of the machine room, but it should be done at least twice a year. If they are not mechanically damaged, the air filters removed can be washed in ultra water and reused. Opinions differ regarding the necessity of cleaning disk packs. Manual cleaning should be done circumspectly and only in justified cases because it may do more harm than good. The stock of disks should be cleaned once or twice a year with automatic mechanical disk-washing equipment. The institute does this with RANDOMEX cleaning equipment.

The magnetic surfaces of the disk packs are on a soft aluminum carrier. The disk packs should not be subjected to great acceleration because the disk

surfaces will be deformed. A disk pack which has been dropped or hit must not be put on a drive unit! It should be put on the axle of the drive unit only slowly. Experts at the institute use a Disc Pack Inspector device to check disk packs which have been dropped or hit--the device can check deformation of the disk surface and the magnetic layer. The vertical play of disk surfaces cannot exceed plus or minus 0.008 inches (plus or minus 0.2 millimeters). In checking the magnetic layer, spot damage cannot go beyond a diameter of 10 centimeters and streak damage cannot go beyond 10 centimeters in length.

Life Expectancy, Faults, Repairs

In regard to life expectancy, one should consider the following: information-preservation properties of the magnetic data carrier; and life-expectancy problems deriving from frequency of use and from transport.

Information Preservation

In regard to the information-preservation properties of magnetic data carriers--as a function of time--we should note that for the great majority of our services, long (several years) storage is not a priority consideration. In the case of our monthly batch processing, we preserve files for 1 month and the longest storage time between modification of certain basic data banks is 1 year, the file is used with monthly querying. Archive magnetic tapes of the customary size (a generation) provide a safe reserve for the magnetic disk basic files of certain enterprise data--even considering security and secrecy requirements. Naturally we also have information preserved on magnetic tape and used for several years. We can say that in the case of the magnetic data carriers regularly used at our institute and described above we have not met with a case where information loss could be attributed to the defective nature of the preservation properties of the data carrier.

Use

In the case of magnetic tapes, it is primarily the stretching of the carrier primary material which causes faults, first ones which can be corrected (built in hardware repetitions or possibilities given by a special software system) and then ones which cannot be corrected. This phenomenon appears largely at the beginning of the tape and thus the fault can be eliminated temporarily by cutting it off. Naturally this method can be used only to a minimal degree per spool (about 300 feet) but even then the tape cannot be used for every task. With the above method and adhering to what has been said about handling, the average life expectancy of a working tape is 1.5-2 years on the basis of our measurements. For those used in archives this time is a good bit longer.

A fault in the magnetic emulsion layer can be demonstrated quickly in use, but the frequency of occurrence is not great. If such faults appear in large numbers in the same shipment then one is justified in making a claim.

Magnetic-tape testing during operation is done with the Recorder File service of the operating system. Magnetic tape fault statistics are prepared in the operating systems of our configurations, with a minimum storage capacity of 512 Kbytes. The information is reviewed weekly and measures are taken to remove the faulty tape from work.

Faults appearing in the layers of magnetic tapes in the course of initialization and testing prior to lasting use can be eliminated by designating reserve tracks. We have not met with a case where there were not enough reserve tracks to avoid faults deriving from this.

Removing a disk from work during operation takes place according to the frequency of the error messages of the Data Check operating system attributed to one disk pack. Then the surface and mechanical parameters of the disk pack taken out of use are checked by technicians. After inspection the disk pack is corrected or reinitiated. The life expectancy of magnetic-disk packs in the course of lasting use is influenced primarily by the head-crash phenomenon. The causes are: dirt on the magnetic layer; the breakdown of the head assembly (or a single head) on the drive unit; or careless handling (for example, putting a good disk pack on a unit with a faulty head).

Such a disk pack must be taken out of use immediately!

In the past 2 years it has become possible to repair faulty disk packs with a patented procedure. The essence of this is that the faulty disk surfaces must be replaced; in general, one can get two good units from three faulty ones. This repair is done as a joint undertaking with MIKOV. The method was proven by us and is very economical; we have met with no faults from the repair. It is rarely necessary to do any scrapping except for the magnetic-disk packs remaining after the repairs, which must ultimately be scrapped. Thus we can say that practically the life expectancy of disk packs if 5-8 years.

Transport

In regard to life-expectancy problems of magnetic data carriers connected with transport we can talk about the shipping of large quantities of magnetic tapes.

In our practice there have been only mechanical problems (breaking, deformation). These arose either from careless placement in the transporting vehicle or from a vehicle collision. In general such problems cannot be corrected and the data carrier must be scrapped.

In the course of studying life-expectancy problems of magnetic data carriers used by us, we got results justifying the factory data; we have had no objections in connection with life expectancy for the types mentioned.

8984
CSO: 2502/61

EFFECT OF ONLINE INFORMATION TRAFFIC ON OVT COMPUTERIZED PROCESSING

Budapest SZAMITASTECHNIKA in Hungarian Dec 81, Jan 82

[Article by Akos Bodlaki, Janos Dobra and Dr Laszlo Kiss: "Effect of Online Information Traffic on Computerized Processing at the National Electric Power Distributer [OVT]"]

[Dec 81, p 8]

[Text] In the past 10 years the foundations for computer technology culture have been created in our homeland also in the area of both manufacturing development and use of computers. In the Sixth Five-Year Plan further progress can be expected primarily with the efficient use of computer technology tools and methods in a broad sphere of production and information processes. The justification of this goal is supported by the fact that we are in a period of a search for ways to convert to an intensive economy and computer technology will have an ever greater and more responsible role in the solution of this epochal and not easy task.

Around the world one can observe that efficient and modern management takes place with the close coordination of production and information processes, which can ensure the unity of planning and management and of organization and guidance. In the production, transportation and distribution of material goods the elements of information systems include economic and technical planning within production and in the areas of production and services. Such information systems are increasingly built on production and services. Such information systems are increasingly built on production processes and are becoming determining factors for enterprise management. Systems based on the exact measurement of objective parameters and generally made up of closed, feedback loops combine the achievements of computer technology and control technology (automation).

Automated guidance systems for technological processes have a close systems technology link with production control and operational information systems and thus constitute a foundation for purposeful, flexible and dynamic enterprise activity. Thus the use of computer technology tools and methods is constantly expanding.

In our homeland, computer technology applications directly linked with production processes still represent a new professional profile. The recognition that strengthening such tasks in enterprise applications is justified was formulated among the goals of the Sixth Five-Year Plan of the Computer Technology Central Development Program:

"In the Sixth Five-Year Plan period, enterprise applications must serve directly an increase in economic efficiency and must help to raise the quality of goods and services. Among the elements of enterprise leadership information systems, we should develop economic and technical planning and production guidance and accounting and the management of costs, stockpiles, fixed assets and manpower, keeping in mind the harmony of organization, automation and computer technology applications, an improvement in receptivity and ensuring the personnel conditions."

An appropriate role in the attainment of these goals will be played by the spread of automated planning, by computerized data collection and processing systems and by automated computerized technological process control. In connection with the latter, for example, we have pointed out that the role of efficient automation in our homeland today is primarily in ensuring production factors interdependent with the homogeneous (even and good) quality of manufacturing and products and in energy and material conservation.

Some of our industrial enterprises recognized in good time the advantages of applying computer technology, for example, in regard to automating technological processes, and they took the necessary steps in time. It is our plan to introduce a few examples in our journal, showing the effects of computer technology applications which build on and supplement one another.

With our series now starting the goal will be to show computer aided applications based on a coordinate unity of production, organization, business and accounting processes. Publishing these examples may serve as a lesson and may draw attention to the creation of additional successful enterprise applications.

--The Editors

The key question in computer applications--whether they be business, process control or other--is the relationship of the computer technology system used and the environment in which the computer is used. This relationship can be described with many parameters (the computer technology information and attitude of the users, the information of the computer technicians concerning the applications environment, etc.) but, of these, the data going into the computer and the data put out by it carry within themselves the "effect" of all the other parameters.

In our article, we will describe a concrete application, the computerized systems guidance of the OVT, seeking an answer to how the "goodness," authenticity and reliability of the input and output data affect the successful and efficient execution of the user functions.

We believe that in every computer application the economy, legitimacy and effectiveness of the application are fundamentally influenced by the above properties of the input and output data.

We consider the OVT application suitable for an introduction of these problems because we have here a use, within process control, which is critical from the viewpoint that the consequences of errors appearing in the input and output data appear immediately in the responses of a technological system, namely the electric power system. It is well known that a fundamental characteristic and problem of electric power production and delivery is that electric power cannot be stored, that is, at every moment the consumer demand appearing must be in balance with production and import.

In addition to this, the OVT application--because of its process-control character--shows more directly and with greater contrast how the effect of irregularities appearing in the input-output data chain (with which the computer is linked to its environment, and with which it thus forms a closed loop in the online or offline mode) appears in the system to be controlled. Where it is not expressly a process-control case, this effect mechanism may appear less directly in time and space, influenced by subjective factors, thus frequently washing out the cause-effect interdependencies. Practicing computer technicians may have witnessed many unproductive debates where the user vilified the computer processing and the computer technician sought the error in the bad data provision or the unprofessional use of the results.

To show this effect mechanism, we will describe two concrete functions, comparing the computer-aided solution with the classical solution, prior to the computer age. In this way, we would like to show how the elimination at the given level of the human or technical errors appearing in the information chain between the computer and its environment (or, in our case, between the controlling system and the system to be controlled) affects the successful execution of the control functions.

These two functions are:

--the storage and use for technical or business purposes of data obtained from the process, and

--closed loop, real-time control of power plants.

Before we turn to an investigation of the above functions, and of the link between input and output data, let us describe what we mean by the "goodness" of the input and output data.

In the broader sense the "goodness" of data is characterized by the following parameters: time relationships (real-time, timeliness, etc.), content characteristics, formal characteristics, availability and reliability.

Keeping the time relationships "in hand" is a key question for every application. In essence this means that the timing of input and output data, the processing and the output should be such that in the offline or online closed loop formed by the computer and its environment the functions should be correctly executed at the time dictated by the user environment. These time relationships can extend from strict real-time relationships to daily, weekly or longer cycles, as a function of the type of use.

The importance of the content and formal characteristics is self-evident. Let us only stress here the especially important data precision in process-control applications. Beyond a certain limit the imprecision of data, which can result from technical or human (subjective) factors, makes questionable the substantive correctness of the data.

The availability of the input and output data is of equal importance with the preceding parameters. By availability we mean both time relationships (data delay and frequency of data loss) and the frequency with which content or formal prescriptions are violated. In either case we are talking about the frequency of the generation of unusable data.

In the following examples, where possible in an obvious way, we will also touch on the relationship of requirements deriving from the above parameters.

Even before the appearance of computers the storage of process data was a natural function in the electric power industry--to provide operational information for ministry and trust leaders, for short- and medium-range planning of energy production and to perform statistical evaluations with the aid of operational data.

These functions required from those guiding operations (the OVT) the collection of data basically characterizing operations--hourly power plant output, peak-time values, import and export performance and energy values, network frequency values, switching events, etc.

Some of this information could be read from control room metering devices (line writers, numerical registers, etc.) and the rest came by telephone.

Even with the most disciplined work, one could obtain data of only limited quantity and precision. In certain cases, the information chain was made up of more links than necessary, which obviously had an effect on the precision and reliability of the information. For planning and statistical purposes, for example, the information was not sufficiently differentiated or of sufficient density.

When the NIMINFO data bank was prepared in the Electric Power Industry Research Institute (VEIKI) and the TIMEA technical planning data bank was prepared in the Hungarian Electricity Works Trust, the processing phase of the mechanization of leader information and technical planning was greatly modernized. But data input, in terms of quantity and differentiation (data types, number of types, etc.), did not follow in every area the possibilities of the data banks and of planning processing. In this phase, the data went into the computer from documents and reports and partly from Telex tapes. The timeliness, precision and reliability of the data were not satisfactory and were difficult to check by the processing sites because of the long information chain containing subjective elements.

The online processing, condensing and storage of operational data characterizing the electric power system could be solved in an obvious way--thanks to the existence of an already available real-time data base--with the HALDIS (Hungarian Automatic Load Dispatching System) system put into operation at the OVT.

Characteristic data reach the computer in an online and real-time way in a cycle of a few seconds via a telemechanical system from the 31 stations and power plants of the country. The chief use of these data is operational system control but in addition the storage of data, after condensation from a real-time data base, appeared as a useful function and self-evident possibility.

At present, the stored data is sent on magnetic tape to the VEIKI computer center for further processing. The data stored are: data characterizing the operation of the electric power system (A group), telecommunications error information and events (B group) and characteristic data of closed-loop power plant control (C group).

The A group is interesting in our case. Statistical processing of data in the B and C groups already takes place in the OVT. In this way, for example, the state of the telecommunications system can be watched continuously, in the statistical sense.

We store the following chief data types in the A group; wattage and unproductive output and voltages of important power lines and power plants, power values (MWh) for power plants, import-export energy values (MWh) and power and frequency data deviating from what is prescribed.

The storage of these data is hierarchical in time. An hourly data base is prepared with appropriate selection and condensation from the real-time data base and a daily data base is prepared from the hourly data base. The daily data bases are stored on disk, going back 5 days. All this is necessary for operational control purposes, but it also makes possible further processing.

Every day, the fifth day data base is put on magnetic tape, in an organization of one day equals one data file. Every datum has a bit indicating "correct data," "bad data," and "manually entered data." This makes it possible, when actualizing the data bank and doing planning calculations, to

process the data in accordance with the qualifying bit. In this way we have available a data file recorded online, in real time, checked and evaluated by software in regard to both form and content. This is used for the following planning, statistical, etc. purposes or provides input data for the NIMINFO data bank, greatly increasing the precision or reality content of planning functions and statistics:

--an increment cost value characterizing the economy of electric power production (cost for one MW extra production) as a monthly/annual average, for peak periods and for day and night periods;

--calculation of power plant production, import performance and total national load as monthly/annual averages by type of day (work day, free Saturday, holiday, etc.). These data are indispensable in planning energy needs and in calculating losses during transit across the country; and

--calculating duration diagrams for [illegible]al national load, use of international power lines, development of import schedules and actual import.

On the basis of experience it can be said that in the production of input data switching from the traditional method to the online system described above had the following advantages in the area of archiving processes:

--human labor expenditure in data collection and preparation was reduced to a minimum at the source sites (substations and power plants) and at the central guidance site (the OVT);

--the reliability and precision of the data increased at the same time;

--the coherence of the data, one to another, improved by orders of magnitude as compared to the traditional method;

--data condensation takes place on the basis of such a large amount of data as to have statistical force; and

--the data flow chain shortened, the subjective factors are of minimal effect, data flow can be checked and the source of errors can be discovered easily.

Today, after realization, it can be said, thanks to the online generation of input data, that the overwhelming majority of planning and statistical processing makes use of these data. The effect of this appears directly in planning achievements and in the precision of statistical values, proving the favorable effect of an online process control system on enterprise guidance economic processing at the higher level of the hierarchy.

[Jan 82, p 8]

[Text] Closed-loop, Real-time Control of Power Plants

Power plant control plays a vital role in the already mentioned basic task of supplying electric power, constantly satisfying the quantitative and qualitative needs of consumers in time.

What all must be taken into consideration in regard to control?

--The momentary consumer demand must always be satisfied.

--Energy exchange must be carried out with the cooperating energy system according to a definite plan.

--Electric power must be produced as cheaply as possible.

--The behavior of the system must be foreseen and one must prepare to follow the changes (changing consumption).

--All this must be done while sparing the power plant park.

Control activity, especially in a critical state, requires real-time, reliable, coherent data from every system element where essential influencing events occur (power plants, international power lines, network transformers, etc.).

What do these requirements mean?

Real Time: Changes must have an effect at the moment they occur.

Reliability: Information free of distortion which actually describes the conditions.

Coherence: The lack of data characterizing the energy system at one and the same time results in control for a condition which does not exist.

Input Data: The effective performance of the power plant, the effective performance of power lines, frequency, frequency changes and the import balance.

The Control Process

At the OVT side:

a. analog or digital measurements, especially a measurement of the import balance;

b. detecting deviation from the schedule;

c. deciding on intervention;

d. distribution proportional to the increment; and

e. issuing orders (with DIDO type telemechanics or by telephone).

At the power plant side:

f. automatic or manual distribution of the order among the power plant blocks;

g. automatic or manual influx of turbine steam; and

h. changing the effective output of the powerplant.

In the case of traditional control, all intervention was entrusted to the dispatcher; he decided whether or not a change was appearing in the import balance. The experience of the dispatcher determined the quality of the control. His action was especially critical at times of swift load change.

If he was 1-2 minutes late in initiating a load change, for example during the morning increase, then the power plants could not catch up with the increasing load. The timely intervention of power plant personnel was similarly critical. Among the factors to be taken into consideration in control there was a virtual absence of estimative activity (one could estimate only on the basis of experience); fulfilling the requirement for planned energy exchange for an accounting period depended on know-how (in a bad case, if there was an under- or overdraw at the beginning of a half hour accounting period and if they tried to balance this out completely in the second half of the period, it produced constant oscillations and a very bad starting condition for the next half hour draw.)

The throughput time for control, from the detection of a deviation through intervention to an actual change in production, could take from 1-2 minutes to 15-20 minutes, which in many cases proved to be too long.

In such a case, when, in the event of an increasing import balance, the reaction of the power plants was late by 10 minutes due to a delay in the dispatcher's decision and the intervention, this meant an overdraw of 50-100 MW, which, on one occasion, caused a loss of several hundred thousand forints. In addition to the damage caused by the delay a case could arise where the delayed control of the power plants took effect in an import balance situation in the opposite direction. Several such errors in one shift could cause a loss of 0.5 million forints.

In the following, we will try to illustrate what an improvement could be achieved with closed-loop automation of control in the precision and economy of carrying out the control function.

How is all this done with a computer?

The computer carries out the following control functions:

--it continually follows deviations from the prescribed schedule values;

--it estimates the load changes to be expected;

--it integrates deviations from the prescribed schedule (it is not intended to follow every deviation in that half hour);

--on the basis of the above and in accordance with economical work points it sends orders to the power plants;

--it sends orders to the power plants automatically via the telecommunications equipment; and

--it constantly displays the most important characteristics of control on a color screen.

There is no decision delay; qualitative differences between control periods due to the mentality of the dispatcher are avoided; and control takes place on the basis of reliable data by aggregating the incoming data and checking their authenticity. The guiding dispatcher watches the computer, thus realizing a control policy depending on the period and possibly intervening in extreme cases (with the exception, naturally, of maintenance of the power plant configuration data and limits representing the control data base--this is done regularly). Computer sensing guarantees the real-time, coherent character of the data. Computerized control can react immediately to large and unidirectional changes; indeed, when developing a control strategy it can take certain changes into consideration in advance, by estimating. Long-range estimates made with the computer can aid this also.

This example illustrates how subjective human factors are removed from the decision and intervention chain of the control cycle, going beyond the use of a modern control algorithm, so that the real-time nature, coheren-e and reliability of the output data (orders) and interventions enter a qualitatively higher category. According to our data thus far, the introduction of computerized closed-loop control brings a profit of 40-50 million forints per year as compared to the classical control method; thus the computer investment is paid off in about 2 years. This profit derives primarily from swift, real-time, and thus much more precise, import activity and from economical fuel use. We have not included here the profit deriving from sparing the power plant park, since this would be difficult to calculate or estimate.

Summing Up

In this article we have tried to illustrate the effect on the processing of various parameters connected with input and output data in an area where a few years ago system control and the related offline processing were done in the traditional way. This online, real-time process-control system can also provide a good example of what the online treatment of input and output data means from the viewpoint of the economy and utility of processing.

Our experience shows that the success and utility of computerized processing are fundamentally influenced by reducing to a minimum the role of subjective elements in the information chain between the computer and its environment so that it has a simple organization consisting of few links. In other words, this means that one should strive to set up a direct online link between information sources or users and the computer and should strive to see that there is harmony between the requirements for computerized processing and the environmental structure and organization of the user. Naturally this represents various difficulties in various applications areas, in many cases tasks which are difficult to solve at present, but the economical

technical possibilities now developing (very intelligent elements at a cheap price, computerized data transmission networks, etc.) and the fact that informatics is becoming an everyday practice justify the hope that we will gradually reduce the gaps existing in many cases between the computer and its environment, thus gradually reducing the problems deriving therefrom.

8984
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PUBLIC DATA NETWORK OF HUNGARIAN POSTS

Budapest SZAMITASTECHNIKA in Hungarian Jan 82 p 9

[Article by Pal Horvath: "Public Data Network of the Hungarian Posts"]

[Text] The spring of 1981 brought a significant event in the development of the data transmission service of the Hungarian Posts--the public, connected-line data network was opened. Great expectations in professional circles preceded the opening of the network as both subscribers and the Posts expected from it an improvement in data transmission possibilities.

Justification

Since the beginning of the postal data transmission service, in 1968, data transmission needs have been satisfied by connected and direct links in existing networks and telephone networks. A connected DATEX network capable of transmission at speeds up to 200 bit/s has also been available since 1971, but it did not become popular and in the spring of this year the new data network took over service to its few subscribers. The great majority of the data stations were established on the telephone network. This network proved less and less equal to the needs posed by quickly developing remote processing, partly because it was not designed for data transmission and partly because it could not be called perfect even as a telephone network. The Posts created the data network before the quality of the postal service could represent a serious obstacle to the development of data transmission. This network serves expressly to satisfy data transmission needs.

There are three types of data networks: line-connected, batch-connected and leased-line (not using connection). The Hungarian network is line-connected. The characteristics of data networks are defined by the series X recommendations of the CCITT. The Hungarian data network meets the pertinent CCITT recommendations.

The European Situation

In the course of recent years, public postal data networks have been opened throughout Europe one after another. In addition to leased-line networks, some of the postal department opening connected-data networks opened batch-

connected networks first, some opened line-connected networks first. By the middle of our decade, most developed European countries are expected to have all three types of data networks, showing that there is a need for all three. The Hungarian Posts has begun efforts to develop the service further.

Line-connected data networks similar to ours, suitable for serving asynchronous and synchronous terminals at low and medium speeds, are operating in the FRG (DATEX-L) and in the Scandinavian countries (the Nordic Public Data Network). An asynchronous line-connected data network with a maximum speed of 300 bit/s is also available in a number of countries (for example, Austria, Switzerland and Italy). Hungary is the first of the socialist countries to establish a data network.

By opening the data network the Hungarian Posts entered the front rank of European countries--in regard to the time of opening and the technical level of relization alike--and in accordance with its possibilities it will strive to maintain a favorable position.

Chief Characteristics of the Hungarian Data Network

Connection in the network is done by a NEDIX 510 A center manufactured by the Japanese Nippon Electric (NEC); this unit is completely electronic, has stored program control and uses a time-distributed switching principle; it also functions as a Telex center. (See SZAMITASTECHNIKA, January 1981--the editors.) The system is a multiprocessor design. The high reliability required is ensured by doubled hardware, self-checking of the system, automatic restart and diagnostic possibilities, among other things.

The transmission technology of the network comes from the NEC also. Time-multiplex equipment installed in the large provincial cities and some Budapest telephone centers connects to the center via high-speed transmission. The terminals are connected to the center or to the outlying time-multiplex equipment by data circuit-terminating equipment (DCE, according to the CCITT English terminology). According to the type of transmission path used, there are two versions of the DCE, a simple one providing base band signal transmission via metal connectors and a more expensive one designed for transmission on telephone channels. The number of DCE versions is further increased by two basic types of subscriber interfaces, the so-called V.24 interface and the X interface.

A developed, centralized maintenance system is called on to ensure operation of the complete network. This ensures the possibility of limiting errors, from the central site all the way to the subscriber interface.

The CCITT recommends DTE-DCE interfaces for data networks, which are much more advantageous than the V.24. Interface characteristics are set forth by the X.20 recommendation for asynchronous, low-speed equipment and by the X.21 recommendation for medium- and high-speed equipment. The data network has switching devices in accordance with both the X.20 and X.21. It would be desirable for the use of these interfaces to spread as soon as possible; for this reason the Postal Central Telegraph Office (PKTH) is supporting their development and use.

With its many lines, the V.24 interface offers innumerable realization possibilities. Unfortunately, the manufacturers, making use of the possibilities, have produced a broad variety of interface versions. The Hungarian data network, however, is suitable for any V interface device because in this case, as a supplement to the DCE, it installed a network control unit (NCU) which reduces the many V interfaces to a uniform X interface. Manual calling and manual or automatic calling-receiving are possible with the aid of the NCU. With the V.24 interface one can initiate an automatic call to contact only one party, as a so-called direct call.

Connecting any subscriber requires a four-wire subscriber line.

Services

Table 1 shows the characteristics of the subscriber service categories provided by the network.

Table 1: Subscriber Service Categories of the Hungarian Data Network

Service category	Polling			Data transmission		DTE mode
	Speed bit/s	Code	Character structure	Speed bit/s	Character Structure	
1	300	IA5	11 element	300	11 element	start-stop
2	110	IA5	11 element	110	11 element	start-stop
	200	IA5	11 element	200	11 element	start-stop
2' (DATEX)	dialing, 10 imp/s			max 200	not fixed	asynchronous
4	2,400	IA5	--	2,400	--	synchronous
5	4,800	IA5	--	4,800	--	synchronous

The network provides full duplex transmission in any category, thus making possible the use of bit-oriented line-control procedures.

In addition to calling a number with the input of the complete calling number, the basic service, the network provides the following special service: direct calling, identifying the calling and called line, closed subscriber group, closed subscriber group with outgoing call rights, forbidding calls into a closed group, forbidding calls from within a closed group, forbidding call initiation, forbidding reception of a call and generation of serial number.

The data network service is complete in that the Posts provides all the devices for transmission and network connection--including the NCU and the DCE--and takes care of maintaining and repairing them. The new data transmission possibility is public and nationwide; that is, it can be used by anyone from the territory of the country. The network does not protect information transmitted between subscribers from bit errors. If necessary, the subscriber must take

care of error protection. In the synchronous categories, the network makes possible completely transparent transmission.

Even after putting the new network into operation, the Posts provides the earlier possibilities for data transmission. The data network is simply a new alternative for satisfying data transmission needs, one which is more advantageous for both sides.

It is possible for remote data processing systems operating on the telephone network to switch to use of the data network without trouble.

The system of data networks will develop into a world network similar to the TELEX network. It is foreseen that the Austrian data network will be accessible from the Hungarian network. Foreign networks will make it possible to reach other networks, by transmitting. (We regularly inform our readers about building up international contacts in the columns of SZAMITASTECHNIKA--the editors.)

It is the goal of the Posts to see that the bit error ratio will be no greater than 10 to the minus 6 for the great majority of subscriber links possible on the network.

The connection time provided in the synchronous categories, averaging only a tenth of a second, makes possible a new type of connected-network operation for terminals and computers. If a sufficient quantity of data awaiting transmission is not available, it is worthwhile to break the connection immediately because making a new connection represents practically no time loss and is sure to be successful. By virtue of caller line identification, partners in logical contact can reject a call from an outside party before contact is established. Thus the correspondence fee calculated on the basis of the duration of the connection can be proportional to the amount of data transmitted, which means very economical data transmission. Naturally, the exploitation of this possibility is possible only with any type of X interface.

Table 2: Maximal Values of Times Characterizing Making and Breaking Contact

DTE mode	Duration (ms)	
	From call to polling signal	From sending of break signal to state of rest
Asynchronous	150*	490**
Synchronous	50*	50*

* maximum time

** maximum break time as determined by signal system

Fees

Data network fees are contained in price agreement VI/14/1981 (AT2) of the Ministry of Transportation and Postal Affairs and in Directive 9/1981 Vig. of the Postal Director General. (Both appeared in Issue 2, 1981, of the POSTAUGYI ERTESITO.) A subscriber information pamphlet containing the fees is available from the Data Transmission Group of the PKTH. It will be mailed upon inquiry.

Increasing the use of the data network naturally depends on the fees as well as on the advantages of the completeness of the service and on the quality of the service provided by the network. From the viewpoint of users, it is an advantage that despite the extra service the data network is not much more expensive than the telephone network and for a significant proportion of needs it even offers a substantially cheaper data transmission possibility.

The economic advantages of the data network can be exploited especially in the case of remote processing systems operating with a large number of data stations throughout the country. According to the experience of the PKTH the present subscribers and the significant number of applicants chose the network largely because of its economy.

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SCIENTIFIC DEVELOPMENT, REQUIREMENTS DESCRIBED

Scientific-Economic Consultation

Warsaw RZECZPOSPOLITA in Polish 1 Feb 82 p 4

[Interview with Zdzislaw Kaczmarek, scientific secretary of the Polish Academy of Sciences, by Witold Blachowicz: "Responsibility of the Scientists; Utilization of Research Centers, Consultation for Economic Elements and Management Organs"; date and place not given]

[Text] [Question] Witold Blachowicz: The first moves within the framework of economic reform have been made. The reform itself, applied under the specific conditions of martial law and great economic crisis, will certainly have a tremendous effect on almost all field, including science. Under these circumstances, therefore, which directions of research should be regarded as being most important and most meaningful for our country?

[Answer] Zdzislaw Kaczmarek: The starting point for scientific activity, under normal conditions, should be a familiarity with the global concept and social and economic directions of Poland's development. The difficultylies in the fact, however, at that the moment there is no such concept.

Since about the mid-1970's we have had no long-range (and implemented) development programs, and long-range economic planning was replaced by immediate plans with a time frame which did not generally exceed one year. At present, we do not have a 5-year plan nor a long-range plan.

Thus the main tasks confronting science derive from the necessity to surmount the present difficulties and certain general development proprieties that are characteristic for the present stage of socialist building in Poland.

Speaking of the most important research directions today, in my opinion the following should be mentioned:

--research leading to savings in raw materials and energy, and application of new energy sources--work which would assist in seeking, discovering and utilizing our own raw-materials sources;

--research which would assist in increasing the production of food and pertain also to agriculture as well as processing, leading to a drastic reduction in losses of food articles;

--work in environmental protection.

Obviously these examples of directions do not exhaust all of even our most critical needs.

[Question] Those were directions that cover the entire scope of our science. Let us now limit this scope to PAN (Polish Academy of Sciences)--its tasks, capabilities, and also its co-responsibility for the past and the future of the Polish economy, Polish science and culture, and our social development.

[Answer] The main task of the Academy of Sciences is to be concerned about the development of those studies which bring original and lasting values to the general achievements of science and culture. We feel ourselves to be less competent to solve tasks connected with the adaptation of scientific results to production practice. PAN and its centers have been assigned, somewhat statutorily, basic research, which is the starting base for developing applied research and practical applications. But at the same time our centers in conducting basic research work together with the economy. For example, in the PAN chemical institutes many new technologies have been developed. In the area of physics, many problems have been solved for engineering needs, for example, for electronics development. In the engineering sciences, for example, such institutes as the Institute for Basic Technical Problems, the Institute of Fluid Flow Machinery, and the Research Center for Basic Metallurgy, have brought their input into the development of Polish mechanics, the production of turbines and ships, in the development of new materials and in steelmaking. There are many examples of interest in practical problems in the area of medicine, biology, and in the agricultural sciences.

Reports prepared by scientific committees of PAN also are tremendously valuable. In the area of professional reports alone many thorough and conscientious reports have been prepared pertaining to the most important fields of socio-economic life, as for example, the state of energy, transport, education, society's health, raw materials reserves, etc. If we are willing, we can find the key to the solutions of many very difficult problems. We are now in the process of preparing a number of professional reports dealing with the present crisis situation. We must say here, however, that, unfortunately, too often use has not been made of this enormous wealth of knowledge and also experience!

[Question] Exactly. Under economic reform changes must also be made in the mechanisms of cooperation between science and industry and practice.

[Answer] The establishment of new relations between science and industry is at this time a matter of paramount importance. Thus far, research was financed from the state budget (for example, in 1981 about 16 billion zlotys) and from industrial funds (in 1981, over 20 billion zlotys). Means from the Technical-Economic Progress Fund were also actually controlled centrally and in large part were in the hands of the ministries, associations and the Ministry of Science, Higher Education and Technology. Now this second source will remain in the hands of the enterprises, which can, of course, assign the profits obtained for other purposes. That is why in

the science-industry system a market must be created, an economic mechanism which will force manufacturers to update their products, to apply new and more effective technologies and manufacturing methods, and all of this will require that scientific searches will have to be employed and the results of research will have to be applied. These matters have not yet been solved, but there is no doubt that along with reform, there must be a change in the whole system of applications.

[Question] It appears from this that the scientific centers will have to come forth with offers to interest the economic centers, that they will have to show more initiative. At the same time, we must remember that many enterprises and entire branches will have to fight "for their lives" in the immediate future, for a chance at survival. Thus orders, too, may be much less impressive from the scientific point of view. What then?

[Answer] Many of the circumstances which you have mentioned will undoubtedly take place. That is why it is in the interest of both the scientific communities and the country to take such action as will utilize, in the next few months, the full potential of science. I have in mind here not just research, which will require the necessary amount of time, but the utilization of existing achievements. We must, in a very short time, during the next few months, make a thorough evaluation of what is available in Polish scientific centers, and also in what areas we can benefit from the achievements of world science. The last 5-year plan should be subjected to this analysis, and the results which we have available should be offered to the economy. This type of work is now underway in PAN. We must also develop scientific consultation for economic elements and management organs. In a word, we must quickly evaluate everything that we have, use it fully, and correctly anticipate development.

[Question] We are forced to relate everything to crisis conditions, although this word was constantly present in our conversation anyway. At the same time, more and more frequently those responsible for the crisis are being sought and the finger is being pointed in the direction of the intellectuals, the educators, and the creative circles. In your opinion, could these circles, the intellectuals, not have prevented the occurrence of the crisis from the 1970's, as well as the dangerous course of events in recent months?

[Answer] Theoretically it can be assumed that a certain opportunity for prevention existed, but the authorities did not want to listen to many of the warnings and alarming reports from the specialists. Certainly most scientific reports were not taken into account. I also believe that a sweeping extension of responsibility over the whole intelligentsia is a big mistake and is not true. It is correct, however, to blame those representatives of the intelligentsia and those groups which functioned in the decisionmaking systems. They are jointly responsible for the crisis that arose. But it is still a matter for discussion as whether these groups always had a substantive basis to be regarded as being fully representative of this social group.

If, however, we are referring to the recent period, then the matter is more complex. It is true that there were, from the intellectual communities, too few public, decisive and unequivocal warnings calling attention to the fact that events are proceeding in a very dangerous direction, even though there was such an awareness of this within these circles. And here those who say that the intelligentsia should search its conscience--why was it silent--are right. A certain justification,

particularly for the technical intelligentsia, lay in the fact that during previous periods their opinions were not generally taken into consideration. Hence, possibly, the mistrust and silence during this last period.

At this point, however, we should say that although these matters are important, they are in no way the most important. The main problem on the national scale comes down to gaining the confidence of the working class which is concentrated in the 200 to 300 largest industrial plants in Poland. This is the key to solving the many unknowns that face our country. In this search for understanding and accord, the scientists can and should play a positive role.

Technical Progress - Basic Research

Warsaw RZECZPOSPOLITA in Polish 4 Feb 82 p 6

[Interview with Prof Dr Jan Kaczmarek, president of the Association of Polish Mechanical Engineers, by Witold Blachowicz; date and place not given]

> [Text] Prof Dr Jan Kaczmarek, the president of the Association of Polish Mechanical Engineers, is a distinguished specialist in the field of principles of machines technology. He manages the Mechanical Systems Plant in the PAN Institute for Basic Technical Problems.

[Question] Witold Blachowicz: The engineering community, with which you have always been very closely related, although it performs the highest scientific functions, has a specific opinion as to the tasks of science. What do engineers expect of basic research, if such a description of this research can be regarded as being completely proper?

[Answer] Prof Dr Jan Kaczmarek: It is the belief of the engineers that basic research is that which has a fundamental influence on the development of many fields, including engineering. The engineering communities include in this category both cognitive research--the discovery of natural phenomena and the laws that govern them--and applied research, which contributes new, original values, facilitating leaps in development, for example, in the field of technology. Employing such criteria, which in my opinion are correct, engineers expect that basic research will produce the most steady inflow of knowledge and information from the country and the world on new scientific developments in individual fields, and that this information will be given in such a way that the engineers will be able to quickly assimilate it.

[Question] These expectations do not pertain, I believe, only to our own scientific base?

[Answer] Naturally not. Certainly no country in the world is self-sufficient in the area of creative ideas. That is why engineers expect a flow of information from domestic centers as well as from foreign centers. Fortunately, results of basic research are published widely and in general are not covered by an embargo. This is so because knowledge of these results alone is not enough. One must know how to interpret these results and be able to make practical use of them, and the path to this is often very difficult.

[Question] One would get the impression that this flow of information goes only in one direction.

[Answer] No. The entire process of technical progress ensues from a continuous interweaving of bids, resulting from basic research, with orders put forth by technology. That is the rule. An off-the-cuff example of this may be research conducted on complete elimination of toxicity of engine exhaust gases. Here the efforts of the scientists encounter the strivings to protect the human environment, mainly the municipal and natural. We very often come across situations from which, out of experience, we get inspiration for directed basic research. In any case, the cooperation of different specialists is essential and often brings very accurate results. For example, in the program which I am coordinating, builders and technologists work very closely with scientists in the field of solid-state physics, with mathematicians, theoretical mechanical engineers, and others.

[Question] In what area can and should a country like Poland develop basic research and what should this be under crisis conditions?

[Answer] We must remember that demographically we constitute about one percent of the world's population. Therefore, we cannot expect to create a scientific base that will satisfy all our needs. Without neglecting proper development in the entire field of science, we must nevertheless make a choice and a far-reaching selection. First of all, we should develop, concentrate our efforts and resources, on those areas of basic research in which, due to our talents and creative inventiveness, we find ourselves in the forefront on a world scale, and particularly if this research is connected with domestic raw materials and economic possibilities.

In making a choice of the directions of research, we should also constantly remember to do what is necessary so that we can transmit world achievements to our science and our economic needs. By skillfully adapting the achievements of others, we can gain a great deal. There are examples of this in many countries, although Japan is mentioned most frequently in this respect.

Countries similar to Poland, developing their economy normally, allocate 10-15 percent of their total outlays for research and development to basic research. We can therefore assume that this amount ensures that science develops correctly, and as a consequence, so does the economy.

[Question] Certainly in our country, also, there are many examples of results obtained because basic research had been conducted previously. Perhaps you can give us an example from your field.

[Answer] Putting it simply, it can be said that my field is that of means of production, manufacturing the means of production, i.e., machines that produce machines. The main problem confronting us is that of improving precision, reliability, durability, accuracy, increasing the number of functions performed, and ever-higher ergonomic requirements. These severe technical requirements demand specific basic research; for example, research pertaining to systems dynamics, mechanics, wear resistance, man-machine relations, automation, control...

The examples which you requested are many. One of them may be the well-known press of Prof Zdzislaw Marciniak, which originated from deep basic research on the plasticity of metals. As a result of this research it became possible to produce objects by plastic forming, for which the press, of unconventional construction, became an executing instrument.

[Question] What should be done to increase the number of such examples as the last?

[Answer] I am in favor of feedback at all levels, between subsectors, branches, and the entire economy, and the potentials of larger scientific-research and technical groups. With such a solution we can achieve both scientific peaks of engineering as well as raise the level of the "lows". Frequent arguments that only peak achievements are important, and that matters can only be settled at the decisionmaking and scientific peaks are simply erroneous. A poorly functioning economy in each of its elements complicates the conduct of scientific research.

[Question] If I recall correctly, you were always an advocate of close cooperation of science with the economy, valuing basic and applied research to an equal degree.

[Answer] The importance of basic research lies not only in the fact that it is a constant source of technical innovations, but also in the fact that it brings its own values into science and culture. Hence the exceptional position of basic research. But we cannot underestimate the social importance of applied research and design work. Every genuine creation is socially necessary and useful, regardless of whether it is the work of a scientist or an engineer.

Preparation of Professional Reports

Warsaw RZECZPOSPOLITA in Polish 18 Feb 82 p 4

[Interview with Prof Dr Zbigniew Gertych, first deputy scientific secretary of the Polish Academy of Sciences, by Witold Blachowicz: "First the Professional Report, then the Decision"; date and place not given]

[Question] Witold Blachowicz: The report that the Council of Ministers' Sociopolitical Committee considered the government's draft resolution on scientific consultation met with great interest in the scientific community. The assumptions proposed in the resolution answer the postulates, long advanced by the PAN, particularly in the area of the necessity to prepare multi-variant professional reports and to consider the suggestions that they contain, before undertaking important decisions. We can thus expect that instances, occurring in the past, in which decisions made previously are supported by professional reports later, will not be repeated.

[Answer] Prof Dr Zbigniew Gertych: The resolution that was prepared has all of the data necessary to make it a valuable instrument by which to create the opportunity to utilize all of the scientific and creative forces and capabilities available in our country. And we are absolutely not concerned here with an attempt to promote the opinion that scientists and specialists from particular fields have been, or always are, right, but that their position, supported, naturally, by knowledge and experience, by familiarity with the world situation, be taken into account by those

who are going to make the decision, and before the decision is made. This does not at all mean that all proposals must be granted. Every decision is, after all, generally the result of certain compromises, and even the choice of the lesser evil. But it is essential that the people who are choosing the variant know all of the argument for and against. Then the extent of the mistakes can be much lower.

Speaking of great experiments, the comprehensiveness of evaluations and the propositions that they contain, are very important. And in this respect, insofar as the professional reports prepared in PAN are concerned, we are in a good situation. These professional reports were generally prepared by very numerous teams of scientists and specialists within the framework of scientific committees, composed of professionals from specific fields, regardless of their place of employment.

[Question] The idea of professional reports arose in the Academy many years ago. How did it originate and what fields of our life have fallen under the scrutiny of various teams of experts?

[Answer] The idea itself arose from the fact that as the country's economic potential developed, changes had to take place at the same time in the internal and external structures, changes in the management systems, and also a modification in the industrial production models which were in effect. All of this, of course, is deeply preconditioned--socially and politically, technically and technologically--but the social and political preconditions are very important. Hence the constant need to study the directions of these changes, to forecast the development trends, and the prepare the indispensable reforms. And so it is the task of responsible experts to show where the given phenomena are heading, what could be the results of this, and what to do in order to utilize the given phenomenon for the country's economic welfare. Such an approach and such strivings were always important, but during the period of crisis they take on an inestimable value.

Professional reports in PAN pertain to almost all of the most important fields and phenomena in our life, from the power industry and raw materials resources, agriculture and food, to social pathology, civilizational illnesses, education and water management. Included also are demography, genetic engineering, environmental protection, fuels of the future, and many other fields. During 1977-1981 alone, 35 large, central, scientific professional reports were prepared, to say nothing of numerous other preliminary studies by scientific committees representing homogeneous fields.

[Question] Irrespective of the value of the professional reports and the original concepts, knowledge and experience accumulated in them, and irrespective of the enormous work put into them by many groups of specialists, experts, recently, were not held in the highest regard by society. They are being charged with the responsibility for the mistakes that were made and for the existing crisis. Does this atmosphere not make it difficult to put into effect the Council of Ministers resolution on scientific consultation?

[Answer] I have even heard this said: "Would that you were an expert!" [spoken as a curse]. But the truth is far more complex. It is true, of course, that there were people who supported, with their learning and their name, ideas that were not the best. Such examples, to which the rule applied that the boss, the authorities, were always right, can be found in every community, and also in the scientific one. But

But the greatest majority of the ideas presented in the professional reports were based on a thorough knowledge of the subject and good faith. When professional reports are being evaluated (even those that missed the mark) one must always ask the question whether the experts had access to all of the indispensable parameters and authentic data which would determine the directions of development. It may turn out that this was not available to them. Hence their responsibility may not be total. Also it happens that during the course of preparing the professional report, external, international factors change suddenly, which could not have been foreseen, as for example, changes in the world economy produced by the increased prices of crude oil, which have a great bearing on the economic problems in our country.

Of course, there are also other dangers, for example, various pressures on the experts. For these reasons we have always been in favor of having PAN fulfill the function of a collective expert. In this way a broad horizon could be provided for the problems considered in the report, and the pressures on such an expert are not effective. In order to end this question, I will say that there are many examples where the experts warned the authorities of the impending crisis. For the most part, however, this was disregarded.

Nevertheless it is a fact that social confidence in the experts of whom you speak dropped recently. What can be done under these circumstances? The only solution is to rebuild this confidence. However, we must realize that both the Council of Ministers resolution and the best professional reports are only component elements for overcoming the crisis. But they will not change much if work productivity and quality does not improve radically, if we continue to eat up all of the imports from capitalist countries. For we are buying food from western countries in the amount of 3 billion dollars, and 2.5 billion dollars would be sufficient for the indispensable purchases of raw materials and coproduced materials in order to fully utilize our productive capacity.

[Question] The most urgent matter now is that of very rapidly utilizing all possibilities, including ideas and proposals contained in the professional reports, for the process of surmounting the crisis. Which of these prepared reports may be most useful and how do we intend to make use of them in the immediate future?

[Answer] It seems to me that first of all we must make use of the reports on the energy industry, domestic raw materials, agriculture and food, social pathology, environmental protection and water management. These are very valuable works. At this moment we are making some revisions from the standpoint of the country's needs during the crisis. We have now sent to the government the first part of the raw materials report, after making such corrections showing the possibilities of utilizing many of our own raw materials, which in the past were being bought in other countries.

We are in the course of preparing proposals for using domestic fodder for animal raising, for example, a method of replacing American corn with our own feed in raising broiler chickens. This method is already being experimentally introduced in large producer cooperatives near Lodz. In any case, it should be said here that the entire expertise on agriculture and food is completely current and can be employed without delay. It should be said here with regret, that if over the past 7 years, as we had

proposed at that time, at least part of industry had been converted to production of means of production for agriculture, the crisis would now not have been as deep. This fact is now generally understood, but making such a decision now, as proposed earlier, will not bring results for another 5 to 7 years.

Research-Development Program

Warsaw RZECZPOSPOLITA in Polish 2 Mar 82 p 6

[Article by Tadeusz Podwysocki: "Government Research-Development Programs; Coal, Copper, Electronization, Protein, Construction, Neoplastic Diseases, Water"]

[Text] Many important tasks are awaiting a scientific solution. Every expert, in one breath, can recite what is most important in the country's future: raw materials and energy, food, health protection, and housing. We have large research programs in all of these fields. Thousands of specialists have combined their efforts in many fields of knowledge.

/Seven government research and development programs were established, with the first stage covering 1976-1980. It should be added here that the program pertaining to water management will be implemented totally over 10 years (by 1985), and the remaining undertakings have been planned for a 15-year perio (to 1990)/ [in boldface]. What is also important is that only the program covering the fight against cancer was a new undertaking. The remaining large government research programs were a continuation of work conducted previously within the framework of crucial problems (after partial modification).

The goal of the concentration of scientific potential was and is to obtain results of research as quickly as possible, and at the highest level. Small teams or individuals conduct studies that are prolonged. The labor-intensiveness of a research subject in Soviet or American industry amounts to from 13 to 24 people-months. But it would take a single scientist 2 years to obtain the same results. The difference is quite important and indicates the advisability of integrating teams around important government research-development programs. What are the goals of these projects? What do we want to achieve by way of establishing large cognitive and utilitarian projects?

The Community's Favorable Attitude

The comprehensive processing of coal is a problem of enormous importance for Poland. /The main goal of the government's PR-1 program is the processing of coal, its gasification and liquefaction, the obtainment of synthetic gasoline, and new coking raw materials. The next research program, PR-2, focuses the attention of the scientists on optimal exploitation of copper resources and the development of production of products from this raw material and its alloys. The degree of the electronization of the economy determines technical progress. The main goal of the PR-3 program, a program for the development of electronic materials and subassemblies, is to surmount the technological barrier. Research program PR-4, however, concerning optimization of the production of protein, should produce new, unconventional methods of manufacture, make the traditional methods more efficient, and make this fundamental

substance of life more economical. Housing construction is a problem of exceptional social importance. PR-5 should give this construction scientific support.

A highly humanitarian project: the implementation of a large research program to combat neoplastic diseases, PR-6, should, in 1990, result in coverage of at least 90 percent of all affected persons with causal and radical treatment and to double the number of permanent, over 5-years' duration, cures. We are approaching a period of water shortage. Only by establishing scientific, technical and organizational bases will we be able to ensure that optimal water management systems will be obtained. PR-7 serves this purpose./ [in boldface].

The Situation with Applications is Worse

Government research and development programs were well-received by the scientific community and made it possible to integrate this community around the important goals. Analyses by the Ministry of Science, Higher Education and Technology, show that the number of applications of results of work obtained from government programs is twice that of those obtained from other research. This same ministry reports that combined expenditures (1976-1980) for large, centrally controlled research programs amounted to about 50 billion zlotys, and the measurable results for the economy are estimated at 160 billion zlotys. That is, for one zloty of outlays, 3.2 zlotys of results were obtained. While outlays for work in the PR-2 program (copper) amounted to 2.4 billion zlotys, benefits in the amount of 6.4 billion zlotys were determined.

A study by the Institute of Scientific Policy, Technical Progress and Higher Education, shows that during the first 2 years of the past 5-year plan only approximately 25 percent of the means were spent on the implementation of government research and development programs. The outlays allocated by the government for these research programs could not be used up. Within PR-7, of 2,275 million in outlays (for the entire 5-year period) during 1976-1977 only 375.4 million zlotys were used. And 1,449.6 million zlotys were left from the 1979-1980 period. It is the same with the program on protein. The situation is still worse where investments within the framework of government programs are concerned. This failure to implement research projects has affected the success of some of the work. But the evaluations of the science ministry and the institute mentioned show that most government programs are implemented in accordance with the plans, and the number of delayed applications or works not performed was slight up to 1979. There were considerable difficulties in the application of results in the years after that. The materials of the Sejm Commission of Science and Technical Progress report that only 72 percent of the government research and development programs were implemented in 1980. Thirteen tasks were not executed.

The authors of the analyses prepared by the Institute of Scientific Policy call attention to a very important matter. That is, that too often the various reasons for delays and improper execution of work is determined to be the result of the objective economic situation and the limitations connected with it. These are not always reasons that can be regarded as being true and correct. The experts say that a system that is adapted only to conditions of abundance is a poor one. The essence of proper management always resolves itself to a choice under conditions of limited means. The present system of government programs (as well as crucial problems) from the very beginning had many pathological features which affected it very strongly particularly under circumstances of crisis, great restrictions and sacrifices.

Lack of Objective Criteria

The system of government research programs, in addition to its good points, also has some defects which were brought out both during the PZPR Central Committee's Twelfth Plenum in June 1978, and also in the analyses of the Supreme Chamber of Control, the Polish Academy of Sciences, the Ministry of Science and the Sejm commissions.

First of all, there are no objective criteria for the selection of research projects. Hence the practice of tacking on various subjects to really important tasks. Subjects of very little importance, unrelated ideologically to government programs, were artificially rammed through. The scientific community attempted at all costs to include in the government programs only those subjects which could successfully be implemented without cluttering up and distorting these priority goals. The adding on of various, far from the intent of the program, subjects, resulted in a partial debasement of the object of the programs under government sponsorship.

Science as Anti-Crisis Force

Warsaw RZECZPOSPOLITA in Polish 5 Mar 82 p 4

[Article by Tadeusz Podwysocki: "Science in the Process of Overcoming the Crisis; Utilizing the Scientific Potential Under Changed Conditions"; passages enclosed in slantines printed in boldface]

[Text] There are many misunderstandings, simplifications, stereotypes, deceptive hopes and pessimisms in the assessments of the potentials of science.

Some are convinced that through science all of the adversities in the economy and in social life can be overcome. This reasoning is based on science's unparalleled successes in the past. New disciplines, such as information science, sociology, cybernetics and materials engineering, have appeared. Twentieth-century discoveries are radically changing the present concepts of natural phenomena and social life. Changes have occurred in processes of production covering all fields of human productivity. Totally new materials, new sources of energy, outer-space vehicles, and computers, have been developed. Hence also the belief that science, together with technology, are able to bring society out of even the worst plights. The point is only how this science can be properly stimulated and utilized.

Others maintain that the stimulation of science and technology absorbs tremendous resources and that the effects are lower than could be obtained by allocating this same money for other purposes. According to the calculations of the experts, out of 2,400, more or less original inventions in a country such as the United States, only one finally reaches the applications stage in production. It is the same in Soviet industry: scarcely one-third of the inventions are used. Science is being charged that it has not done much to solve the most important world problems: hunger, numerous diseases (including cancer), reduction of human aggression, and the negative effects of urbanization and industrialization.

Of course, science supported by technology, is not and never will be a universal cure for all of society's ailments or a barrier on the road to economic development. There is no one factor, no one means that can create miracles. What appears is an interweaving, a whole group of different economic, social, organizational, legal and political forces which shape and exert an influence on the life of every country and nation. However, science can assist in understanding these phenomena; it can furnish knowledge on each of the factors, systems and processes. And to know and understand is already a great deal. It is already a step to directing and managing, planning and foreseeing which of the possible results is the most rational, accurate and promising.

Science and technology are not able to bring the country out of the crisis, as some would believe. But technical progress can considerably increase the national income, have some effect on management efficiency, and alleviate many negative effects of destabilization. /But at this point we must immediately add: the results of science and technology will appear only when activity in this sphere is united in true bonds of matrimony with the economy, production, the market, and investments. It is hard to disagree with Prof Edwin Mansfield from the state university in Philadelphia when he says research-development work alone has, in general, little meaning for an enterprise. Only when it is combined with buildings and equipment, production, sales, and financial capabilities, can this work bring results in the form of production of great trade importance, or technology./ What an accurate contusion [as published].

I am deeply convinced that if we are able to apply scientific-technological potential to changed conditions, than we will achieve great anti-crisis strength. There are several lines of attack available to science and technology. The human and materials potential on these lines of the front may even be determining: it will greatly accelerate the process of coming out of the crisis.

/The first line of attack for scientists and engineers is the wide range of technology and design which can greatly reduce the costs of manufacturing. This is a fundamental problem both now and in the future. It is here that the most good can be done in applying technical progress./ The application in Poland of automation systems in production processes in sugar-beet factories gives, at an average 3,000 tons per day productivity, employment savings on the order of 50-60 persons, while at the same time, production of the entire sugar-beet factory increases an average of 15 percent. In this case, technical progress means that sugar losses are reduced by about 5,000 tons during one sugar-beet processing period, and there is a reduction in thermal energy consumption (a savings of 45,000 tons of coal!).

Foreign calculations indicate that application of new technologies in the production of ammonia and construction of installations with a higher production capacity brought a reduction in prime manufacturing costs of over 20 percent. In our country we have both professionals as well as centers that are capable of developing and applying many technologies that could bring about reductions in manufacturing costs. Some of these technologies have already been developed and could not in past years get as far as the production floors. There was no shortage of obstacles in the path. Reform should bring about a demand for action by research-development facilities which would reduce production costs.

/The second line of the research-development front should cover processes that improve efficiency in the consumption of materials, raw materials, fuels and energy. The possibilities are immense and the needs are even greater./

Savings measures of a new technology in metallurgy can reduce the direct consumption of energy by 30 percent over a longer period of time. This represents about 15 million tons of standard fuel. Modernization of boilers in electric power plants would also save millions of tons of coal and make it possible to effectively burn the poorer grades of coal. There are plenty of examples. They can be cited endlessly.

/The third line for research-engineering facilities takes in the extremely important field of influence of technological and organizational progress on the degree of growth of labor productivity. Soviet and American research shows unequivocally that labor productivity can be increased by applying technical and organizational progress. If scientific-engineering progress is applied intensively, management and organization of production is improved, then the increase in labor productivity will surpass the development of the technical equipping of the work. And this, as a result, means a reduction in the capital-intensiveness of production./

Research and devlopment to increase labor productivity and improve its organization is indispensable. We refer here to mechanization, tool construction, and making transport inside the enterprises more efficient. There are many subjects that require quick solutions. One urgent matter is that of modernizing methods of management, reducing the range of idle and unnecessary actions, and giving the organizational structures more flexibility in science and production.

/The fourth line should concentrate the efforts of the scientific and technological community on solutions and applications which should assist in utilizing domestic raw materials and other materials, and on the replacement of imported, heretofore, means of production./ Technologies are needed which would aid in making use of secondary raw materials. In 1985 we will have 4 million tires to retread, and in the textile industry about 300,000 tons of valuable waste-type raw materials will be available.

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